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# A Study of the Large Block Test as an Analog for Geothermal Site Characterization

S. Johnson

August 1, 2011

Fall Meeting of the American Geophysical Union  
San Francisco, CA, United States  
December 5, 2011 through December 9, 2011

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## **A Study of the Large Block Test as an Analog for Geothermal Site Characterization (T49: Stimulation, Characterization and Maintenance of Fractures in Geothermal Systems)**

**Scott Johnson**

As part of the Yucca Mountain Project, a thermohydromechanical characterization was carried out during the Large Block Test (Lin, 2001). This represents one of the relatively few efforts to use a meticulously characterized rock sample (through both surface mapping and fracture surface reconstruction using data from 70 boreholes) at an intermediate scale to determine THM properties of a site as well as validate the numerical capabilities used to determine site response. This also provides a unique analog to geothermal sites.

The observational dataset is reanalyzed here to improve and extend the statistics derived for the fracture sets in the sample. A similar break in the power law scaling for the fracture length is found at sub-meter scales, similar to the trend found by the survey of Odling (1997). In addition to fracture length distribution, the orientations and locations of the fractures in the near-surface region of the Fran Ridge Topopah Spring Tuff are determined. Some data on the apertures of particular fractures are also extracted.

These statistics are used with a fracture set generation code to synthesize fractally distributed samples from the derived distribution. The concept of the RCC hierarchical box-counting method (Gagnepain, 1986) is adapted here for the synthesis of approximately fractal distributions of fracture barycenters. Additional statistics are generated by sampling from distributions derived from the dataset and augmented by an empirical correlation between fracture length and aperture size. Using these samples, meshing is performed for each, and a statistically representative series of DFN analyses are conducted to provide improved distribution parameters for resolving the multi-scale hydrologic properties of the Topopah Tuff in the YMP. The results of these analyses provide a bounding distribution of homogenized permeability tensors for the site and provide a template for similar analyses on geothermal sites.

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.